

Module 9

Chain Slings



Learning Objectives

By the end of this section, you will:

1. Know correct rigging terminology and nomenclature.
2. Select appropriate slings and rigging hardware for rigging tasks.
3. Know how to properly perform inspection of rigging slings and hardware in accordance to government regulations.
4. Be able to identify a chain or chain sling for excessive wear.
5. Know the appropriate chain grade for a set of lifting conditions.
6. Know appropriate types of links for overhead lifts.
7. Know the appropriate sling material when given a working temperature.

All chains are not intended for lifting. Do not rig with a chain that lacks identification marks.

What must be checked?

- » Select proper chain alloy for rigging applications.
- » Identify chain markings.
- » Inspect chain to manufacturer specifications.

Grade 7 or 70 chain is used to transport loads.

Grade 7 or 70 was designed specifically to provide a light, yet strong chain for binding, tie-down, lumbering, towing and construction use. This chain meets all requirements set by the Department of Transportation and CVSA for truck tie-down use. Chains are primarily used in securing equipment to a trailer.



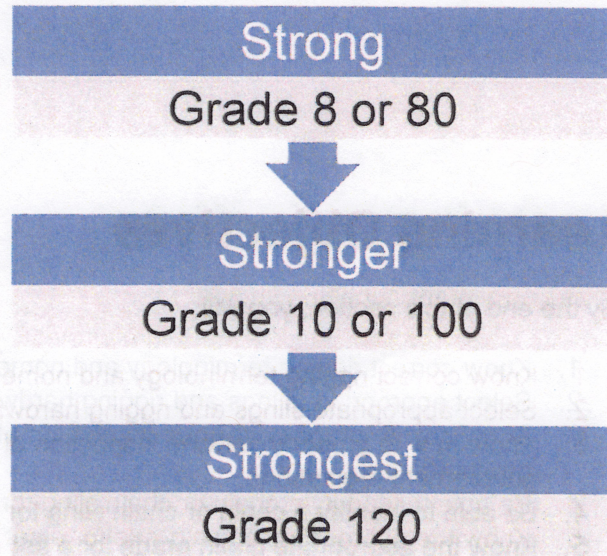
Not acceptable for overhead lifting!

Grade 8, 80 or 800 chain is used for overhead lifting.

The most commonly used chains for overhead lifting are rated at Grade 80, however, the industry is moving to the safer and stronger Grade 100 and Grade 120 chains.

Working Load Limit (WLL) increases with grade.

Stronger grades can mean less weight and higher Working Load Limit (WLL). The advantage to the rigger is utilizing smaller size chain which makes the rigging easier to handle.



Working load limit charts are provided by manufacturers.

Gunnebo Johnson Corporation >> Grades 80 & 100 Alloy Chain (KLB)

MODEL	CHAIN SIZE (INCHES)	GRADE	WORKING LOAD LIMIT	DIMENSIONS (INCHES)			WEIGHT 100 FT lbs
			* (Lbs) at 90°	D	E	H	
KLB-7-10	9/32	100	4,300	0.28	0.83	0.41	77
KLB-8-10	5/16	100	5,700	0.32	0.94	0.45	97
KLB-10-10	3/8	100	8,800	0.40	1.18	0.57	151
KLB-13-10	1/2	100	15,000	0.52	1.54	0.72	253
KLB-16-10	5/8	100	22,600	0.65	1.89	0.91	394
KLB-20-10	3/4	100	35,300	0.81	2.36	1.12	630
KLB-22-8	7/8	80	34,200	0.87	2.60	1.20	715
KLB-26-8	1	80	47,700	1.02	3.07	1.38	961
KLB-32-8	1-1/4	80	72,300	1.26	3.78	1.69	1545

* Design Factor 4:1 Proof tested and certified

ASME
SETTING THE STANDARD

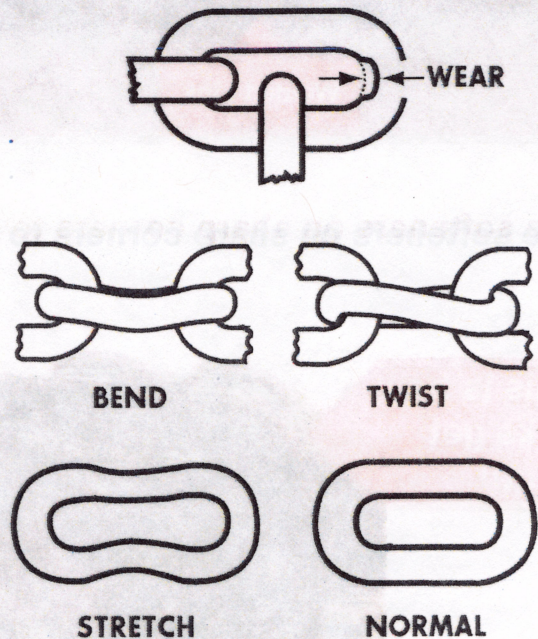
B30.9

Manufacturers will rate chain with a safety factor of four. Chain damage includes wearing, bending, twisting and stretching.

Twisting is one of the leading causes of chain slings being taken out of service.

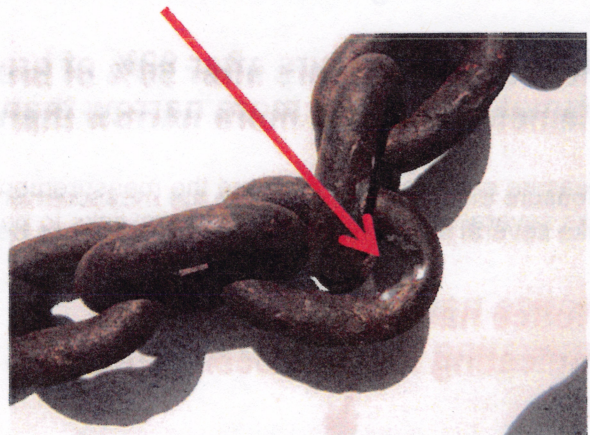
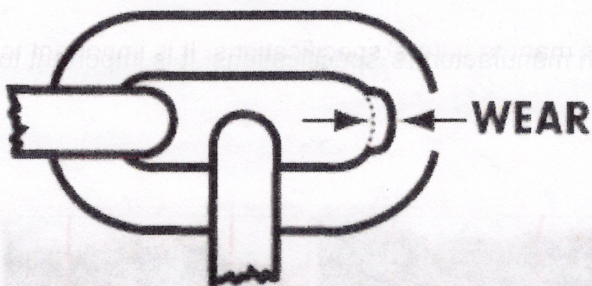


What is the damage here?



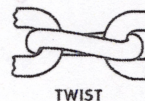
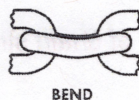
Remove chains from service when wear reaches 10% of original diameter.

Normal wear areas





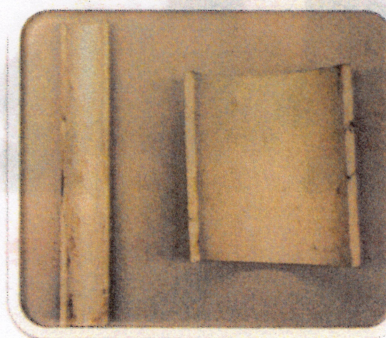
Bends are caused by excessive side load or no softeners.



Twists are caused by loading tangled chain

Use softeners on sharp corners to avoid bending links.

This is how links get bent!!



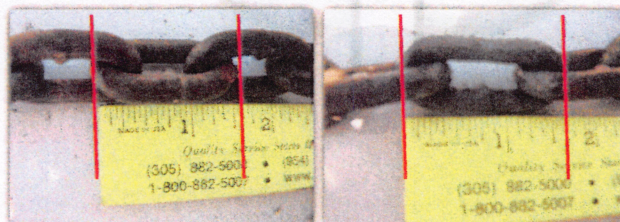
PVC pipe can be used to protect the chain

Chain is designed to stretch 15% before breaking.

Most stretch occurs after 90% of breaking strength is applied. Notice diameter of link is more narrow than the link on the left.

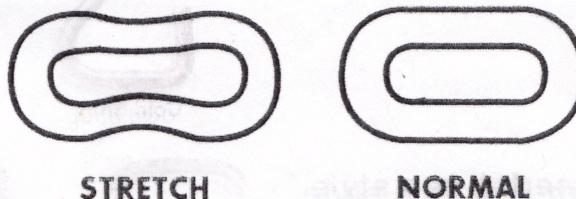
Measure each link and compare the measurements with manufacturers' specifications. It is important to take several measurements on several links to be sure.

Notice narrower diameter, indicating link has been stretched



Important to measure several links.

Stretch tolerance is 5% of original length.



Chains with gouges, nicks, and cuts must be taken out of service.

If 10% of the original diameter is removed then the chain must be taken out of service.



What are the advantages of chain slings?

- » Rugged - Chain slings are made of an alloy steel and provide a powerful lifting option.
- » Multiple Connections - Different metal endings can be fixed to chain slings allowing for a variety of hitching options.
- » Tolerance to High Temperatures - The properties in a chain sling allow it to lift loads of 1000°F or repeatedly lift loads of 400°F, according to manufacturers specifications.
- » Ideal For Outdoor Use - Chain slings are also impervious to any UV damage making it safe to consistently use in the outdoors.

What are the disadvantages of chain slings?

- » Limited Flexibility - Unlike nylon slings, chain slings have no shock absorbency and can snap.
- » Abrasive - Because of the metallic surface, chain slings should not be used with a delicate or painted surfaces.
- » Heavy - For its capacity, chain is the heaviest, compared to nylon or wire rope slings.
- » Metal to Metal Contact - Chains slings are susceptible to sliding on metal surfaces.

These link styles are not designed for overhead lifting.



Cold Shut



Lap Link



Hammerlok is a style of link that can be used for overhead lifting assemblies.

- Grade 8 or grade 10.
- Matched to chain size and grade.
- Not for splicing or repairs.
- Designed for end terminations.



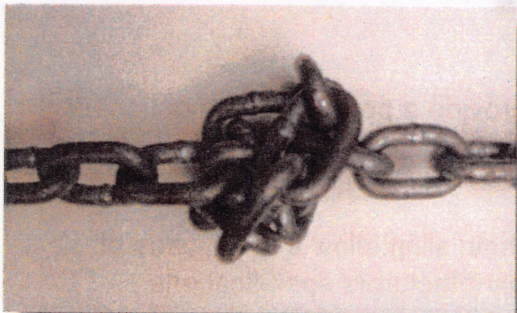
Connecting Link



Quick Link

Never use a nut and bolt to attach chain links together or to attach a hook.

Never use a knot to shorten a chain sling.



Temperatures above 600°F will reduce the WLL of chain slings.

Avoid temperatures above 1000°F. According to OSHA's 3072 bulletin, "Chain slings are the best choice for lifting very hot materials. They can be heated to temperatures of up to 1,000°F (538° centigrade); however, when alloy chain slings are consistently exposed to service temperatures in excess of 600°F

(316° centigrade), operators must reduce the working load limits in accordance with the manufacturer's recommendations."

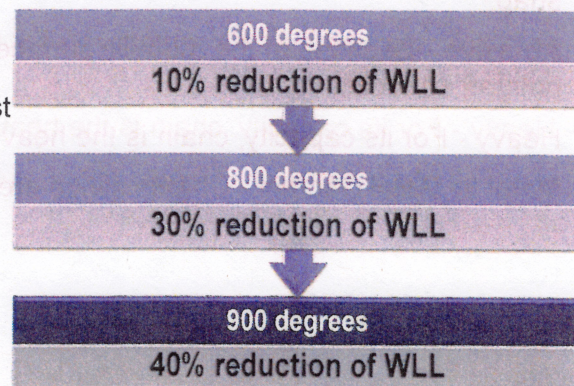
The OSHA General Industry standard for chain slings, 1910.184(e)(6), indicates:



1910.184

"Safe operating temperatures. Employers must permanently remove an alloy steel-chain sling from service if it is heated above 1000°F. When exposed to service temperatures in excess of 600°F employers must reduce the maximum working-load limits permitted by the chain manufacturer in accordance with the chain or sling manufacturer's recommendations."

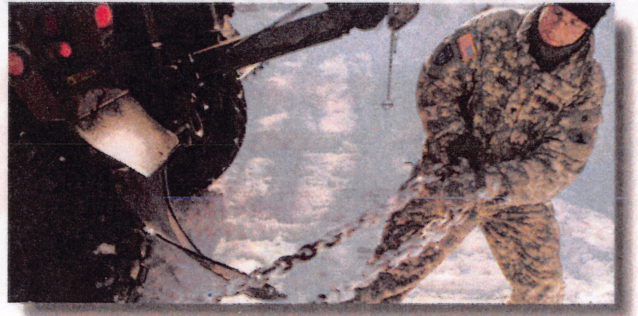
As temperature increases, WLL decreases.



Temperatures below -40°F will cause chain to become brittle.

Environmental factors such as extreme temperatures play a key role in selecting the correct rigging for the job. Temperatures below -40°F will cause chain to become brittle.

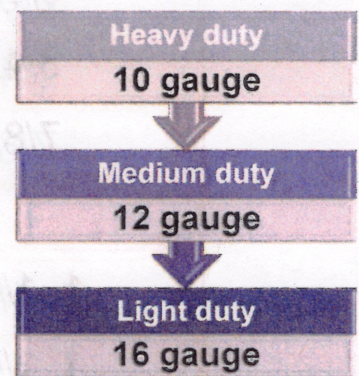
OSHA indicates that "If chain slings are to be used at temperatures below minus 40°F (minus 40°C), consult the chain manufacturer."



Heavy, medium and light duty metal mesh slings are available.

Remove from service criteria:

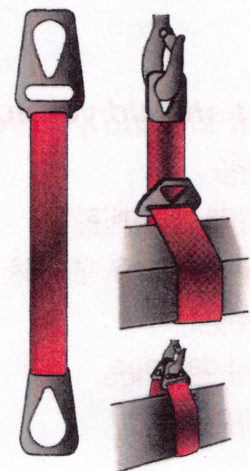
- A broken weld or brazed joint along the sling edge.
- A broken wire in any part of the mesh.
- Reduction in wire diameter of 25% due to abrasion or 15% due to corrosion.
- Lack of flexibility due to distortion of the mesh.
- Distortion of the choker fitting so that the depth of the slot is increased by more than 10%.
- Distortion of either end fitting so that the width of the eye opening is decreased by more than 10%.
- A 15% reduction in the original cross-sectional area of metal at any point around the hook opening of the end fitting.
- Visible distortion of either end fitting out of its plane.
- End fitting distortion or damage (broken welds, cracks, bend).



Many braided wires provide exceptional strength and flexibility, are nearly impossible to kink and are used in high capacity lifts.

Braided slings are made up of many small diameter wires braided together. Synthetic slings offer:

- Protection for machined parts.
- Non-sparking quality.
- Little added weight to lift.
- Elasticity (to reduce shock loading).



Working temperature range varies with sling material.

Working range for bare slings: -20°F to 550°F

Working range for PVC or neoprene coated slings: 0°F to 200°F

OSHA requires assemblies be removed from service when any point of any chain link exceeds the Maximum Allowable Wear.

Chain size (inch)	Max allowable wear (inch)
1/4	3/64
3/8	5/64
1/2	7/64
5/8	9/64
3/4	5/32
7/8	11/66
1	3/16
1 1/8	7/32
1 1/4	1/4
1 3/8	9/32
1 1/2	5/16
1 3/4	11/32

What should you look for during chain sling inspection?

- » Wear.
- » Bends or twists.
- » Cuts, gouges, cracks.
- » Stretch.
- » Heat damage.
- » Corrosion.